

09/914648

T 202.293.7060
F 202.293.7860

SUGHRUE MION ZINN MACPEAK & SEAS, PLLC

www.sughrue.com

August 31, 2001

BOX PCTCommissioner for Patents
Washington, D.C. 20231PCT/FR00/00466
-filed February 24, 2000

Re: Application of Philippe DEROUAULT and Eric LEMAISTRE
MOLDING UNIT AND EXTRUSION-BLOW MOLDING MACHINE EQUIPPED
THEREWITH
Assignee: **SIDEL**
Our Ref: Q65500

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter II of the Patent Cooperation Treaty:

- ☒ an English translation of the International Application.
- ☒ three (3) sheets of drawings.

The Declaration and Power of Attorney and Assignment, will be submitted at a later date.

It is assumed that copies of the International Application, the International Search Report, the International Preliminary Examination Report, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

The Government filing fee is calculated as follows:

Total claims	9	-	20	=		x	\$18.00	=	\$0.00
Independent claims	1	-	3	=		x	\$80.00	=	\$0.00
Base Fee									\$860.00
Multiple Dependent Claim Fee									\$270.00
TOTAL FEE									\$1130.00

A check for the statutory filing fee of \$1130.00 is attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from March 08, 1999 based on French Application No. 99/02928.

Respectfully submitted,

Mark Boland
Registration No. 32,197

MXB/amt

3/p₁h

09/914648
518 Rec'd PCT/PTO 31 AUG 2001

Molding Unit and Extrusion-Blow Molding Machine Equipped Therewith

The present invention relates to the field of extrusion-blow molding machines for articles made of thermoplastic material, particularly for the production of containers such as bottles, flasks
5 or water bottles.

Such a machine essentially comprises an extrusion head that produces at least one tubular plastic parison, at least one molding unit comprising a mold in two parts, the two parts of the mold being positioned so as to close over the parison that is still soft from the extrusion head, and a blow-forming station that is provided with means for injecting air under pressure inside the
10 parison enclosed in the mold. The air under pressure allows the parison to be deformed so that it fits the form of the mold cavity.

The machine can also comprise a degating station that allows the excess material to be cut off.

More particularly, the invention relates to a molding unit for such a machine. This molding
15 unit comprises a mold in two parts in which each mold-half is borne by a movable support. The two movable supports are moved transversely in opposite directions with respect to a frame that holds them. In an open position, the two mold-halves are transversely separated from each other to allow a blank of the article, that is, a parison, to be inserted in a cavity delimited between the two mold-halves. In a closed position, the two mold-halves are pressed against each other by
20 their front faces, and the supports are connected to each other by locking means.

The two supports can be movable in transverse displacement, but they can also be moved in rotation, for example around a common axis parallel to the plane of the joint of the two mold-halves.

Of course, the molding unit has a mechanism for simultaneously moving both mold
25 supports. This mechanism is adapted to the relative path of the two supports.

In extrusion-blow molding machines, it is often provided that the molding unit comprises, between at least one of the mold-halves and the associated support, fluid pressure compensating means that push this mold-half transversely toward the other mold-half. These compensating

means make it possible to prevent the two mold-halves from separating from each other under the effect of the blow pressure. They also enable the front faces of the two mold-halves to be securely closed against each other, in spite of the presence of the excess material caught between the two mold-halves at the time of closure.

5 An extrusion blow-molding machine incorporating these characteristics is described, for example, in the document US-A-5.730.927.

10 The compensating means that make it possible to securely and effectively close the two mold-halves against each other exert large forces on the support that bears them. These forces increase with the size of the article to blow-mold, or in the case of a mold with multiple cavities, with the number of cavities of the mold. In effect, the forces exerted by the compensating means on the support are proportional to the blow-molding pressure, as well as to the blown surface area, in the transverse direction, of the cavity or cavities of the mold. They also depend on the amount of material caught between the two molds.

15 Of course, locking means are provided to resist these forces that tend to separate the two supports from each other.

 However, the locking means can not prevent the support that bears the compensating means from tending to become deformed under the action of these forces.

20 Such being the case, this deformation, even if not very large, is then transferred to the mechanism that controls the movements of the supports. This mechanism must therefore be able to absorb without damage the forces resulting from such deformation, which generally leads to making the mechanism larger than what would be exactly needed to provide the opening-closing function of the mold.

25 Another solution consists of making the mold supports particularly rigid. In this case, however, the supports are then heavy and bulky, which, in addition to a higher production cost for these supports, also requires that a stronger control mechanism be provided to cause their movements. The weight of the mold supports is particularly detrimental in the case of high speed machines, in which there is a need to reduce the opening and closing time of the molds as much

as possible, and thus to increase the speed of these movements, in spite of the inertia caused by the weight of the supports.

A purpose of the invention, therefore, is to propose a new design of the molding unit that allows lighter mold supports to be used, without, however, requiring oversized means to control their movements.

To that end, the invention proposes a molding unit of the type described above, characterized in that the mechanism for moving the supports is linked at least with said associated support by elastically deformable means capable of compensating the deformation of the support produced by the forces exerted by the compensating means.

According to other characteristics of the invention:

- the plate can pivot with respect to the support;
- the movement mechanism acts on a plate that is slideably mounted on the support, and spring forming means are interposed transversally between the plate and the support;

the spring forming means comprise blocks of elastomer material;

- the mechanism for moving the two supports comprises a drive screw that is provided with two threaded sections, the direction of turn of the threads of the two sections being opposite and each threaded section cooperating with a nut linked to one of the supports, and elastically deformable means are interposed between the nut and the support to which it is linked;

- the nuts are ball-race nuts; and

- the molding unit comprises compensating means only between one of the mold-halves and the associated support, and the elastically deformable means are interposed only between said associated support and the movement mechanism of the supports.

The invention also proposes an extrusion-blow molding machine, characterized in that it comprises at least one molding unit incorporating any one of the preceding characteristics.

Other characteristics and advantages of the invention will appear from the following detailed description, as well as from the appended drawings in which:

– Figure 1 is a diagrammatic view in perspective illustrating a molding unit according to the method of the invention, in which the control mechanism of the supports is made in the form of a screw mechanism and ball-race nuts;

– Figure 2 is a more detailed exploded view in perspective illustrating the deformable means interposed between the screw/nut mechanism and one of the supports;

– Figure 3 is a cross sectional view illustrating more precisely the assembly of the deformable means.

Figure 1 diagrammatically illustrates a molding unit 10 for an extrusion-blow molding machine. The unit 10 essentially comprises two mold-halves 12, 14 each of which is born by a support 16, 18. The two supports are movable along a transversal axis perpendicular to the plane of the joint of the two mold-halves 12, 14, between a closed position and an open position illustrated in Figure 1. The two supports 16, 18 each comprise a base 15 on which is mounted a mold clamping unit 17 which presents a rear plate 19 and two side flanges 21. The two front parts facing the two mold-halves have cavity-halves 20 which, when the mold is closed, define a cavity in the shape of the article to be formed.

In this particular case, the supports 16, 18 are transversally movable because their respective bases 15 are slideably mounted on transverse rails (not represented).

In order to control the relative movements of the two supports 16, 18, the unit 10 comprises a screw/nut type mechanism comprising a screw 22 with transverse axis A1 and two ball-race nuts 24 one of which is integral with a first support 16 and the other 26 with the second support 18. The screw 22 is transversely fixed with respect to a frame that holds the molding unit 10, and it comprises two threaded sections 22a and 22b which present thread pitches for which the directions of turn are opposite to each other. The nut 24 of the first support cooperates with the first 22a of the sections while the nut 26 of the second support 18 cooperates with the other section 22b. In this way, when the screw 26 is driven in rotation around its axis A1 by a motor 28, the two supports 16, 18 are simultaneously controlled in transverse displacement in opposite directions. If the value of the pitch of the two threaded sections is the same, the two supports are moved over an equal distance.

This mechanism is particularly advantageous because it has a small number of parts, while still ensuring great precision and perfect reproducibility of the simultaneous movements of the two supports. Moreover, the use of ball-race nuts makes it possible on the one hand to obtain good energy efficiency, and on the other hand to obtain movements with high speeds and strong accelerations.

The molding unit 10 is therefore intended to be placed in mold-open position beneath an extrusion unit having as many extrusion dies as the mold has cavities. When the parison extruded by each head has reached the desired length, the mold is shut to enclose, in each cavity, a parison section. The mold is then closed by the screw/nuts mechanism, and the two supports are secured to each other by locking means (not represented), placed for example at the front edges of the flanges 21. Next, the molding unit is intended to cooperate with a blow-molding station to inject a fluid under pressure into the parisons enclosed in each cavity, in order to mold the parison to the shape of the cavity.

To compensate for the tendency of the mold-halves to separate under the action of the blow-molding fluid, the blow-molding unit, according to the invention, comprises fluid pressure compensating means that are interposed transversally between the support and the associated mold-half to push the mold-half in question back in the direction of the other mold-half.

In the proposed exemplary embodiment, compensating means are provided only between the first support 16 and the associated mold-half 12. The second mold-half 14 is rigidly fixed to the second support 18.

The compensating means are formed here by a flexible cushion 30 placed between the rear plate 19 of the support 16 and a rear face of the mold-half 12. It will be noted that the cushion has a surface area that is substantially equal to, or even greater than, that of the mold-half. In this way, by inflating the cushion 30 with a fluid at a pressure substantially equal to that of the blow-molding fluid, the resulting action of the two fluids on the mold-half is an action that pushes toward the other mold-half 14.

In the extrusion-blow molding process, pressures on the order of 10 bars are generally used. Also, when the mold has a large cavity or several cavities, the forces exerted by the fluid

pressures can be quite large. Such being the case, the compensating cushion 30 is essentially supported against the rear plate 19 of the mold clamping unit 17.

According to the invention, mold supports are provided that are light enough to allow high movement speeds without having to use very powerful motors. Also, under the effect of the compensating cushion 30, it can be seen that the support can be significantly deformed, while still remaining within the scope of elastic deformation. Such deformation, therefore, can produce stresses where the support 16 is connected to the mechanism that controls its movements.

Also, according to the invention, it is provided that elastically deformable means be interposed between the first support 16 and the corresponding nut 24.

In the exemplary embodiment illustrated in Figure 1, the screw 22 is placed on one of the sides of the molding unit and not in the transverse plane of symmetry thereof. The nuts 24, 26 are attached to the plate elements 32 of the bases 15 of each of the supports, the screw 22 passing through said plate elements 32, which are perpendicular to the axis A1.

The deformable means according to the invention are more precisely illustrated in Figures 2 and 3.

Thus, the nut 24 is attached, by four screws 36, to a plate 34 that is transversely slideably mounted on the plate element 32 of the base 15. To accomplish this, the plate 34 has eight orifices 38 that correspond to eight orifices 40 made in the plate element 32, in front of which the plate 34 is placed. Through each of these orifices 38, 40, a screw 42 is engaged, the head of which is supported against the plate 34 and the shank of which is only threaded at the end, so that it has a smooth section 44 under the head.

The shank of each screw 42 is thus engaged transversely toward the rear successively through the plate 34, the plate element 32 and a tubular stud 46 made of an elastomer material. Finally, the free end of each screw 42 is screwed into the distribution plate 48 in such a way as to, on the one hand, force the plate 34 against the front face of the plate element 32, and on the other hand, to transversely tighten the tubular stud 46 against the rear face of the plate element 32.

In the proposed example, the eight screws 42 are regularly distributed angularly around the axis A1 and two distribution plates 48 are provided, each plate receiving the threaded end of four screws 42.

The smooth shank 44 of the screw 42 has a length that is less than the length of the transverse assembly of the plate 34, the plate element 32 and the undeformed tubular stud 46, in order to be able to prestress said stud. Moreover, the smooth shank has a smaller diameter than the orifices 40 of the plate element 32, in order to allow each screw 42 to slide freely with respect to the support 16.

Preferably, the threaded portion of the screw 42 is of a smaller diameter than the smooth section 42, so that they are separated by a shoulder 49. Thus, the screw can be tightened until the distribution plate 48 is against the shoulder 49, determining a precise tightening value for the elastomer stud 46.

Thus assembled, the plate 34 is therefore flexibly linked to the support 16, which allows the plate element 32 of the support 16 to move with respect to the screw 22 without carrying along with it the nut 24 when the support 16 is deformed. The force exerted by the nut 24 on the screw 22 is thus limited to the value of the compression force of the studs 46.

The movement of the plate 34 with respect to the plate element 32 is essentially a transverse sliding movement, but because of the limited support length of the screws 42 in the orifices 40, the plate 34 can also pivot slightly with respect to the support 16 around two axes perpendicular to the axis A1 and perpendicular to each other.

Specific means are preferably provided that make it possible to prevent any rotation of the plate 34 around the axis A1. This function should not be carried out by the screws 42, because friction might be produced that could hinder the relative sliding of the plate 34 and the support 16. Also, a groove 52 radially open to the outside with respect to the axis A1, is provided in the plate 34. A key 50, integral with the base of the support 16, is received in the groove 52 to ensure precise angular indexing of the plate 34 around the axis A1, without inducing a shearing force on the screws 42.

Of course, the invention is not limited to the single embodiment described in detail above. Indeed, the invention could be implemented when the mechanism for moving the supports is of another type, for example a cam mechanism. Also, the invention is applicable when the supports are actuated by a relative movement other than transverse displacement, e.g., a rotational movement as in the case of a "portfolio" mold. In the same way, a person skilled in the art could easily determine equivalent embodiments for forming the elastically deformable means that are interposed between the mechanism and the support.

CLAIMS

1. Molding unit for an extrusion-blow molding machine for articles made of thermoplastic material, of the type in which the molding unit (10) comprises a mold in two parts (12, 14), each mold-half (12, 14) being borne by a movable support (16, 18), of the type in which the two movable supports (16, 18) are moved transversely, in opposite directions with respect to the frame that bears them, between an open position in which the two mold-halves (12, 14) are transversely separated from each other, to allow the insertion of a blank of the article in a cavity delimited between the two mold-halves, and a closed position in which the two mold-halves are pressed against each other and in which the supports (16, 18) are connected to each other by a screw means, of the type in which the molding unit (10) has a mechanism (22, 24, 26) of simultaneous movement of the two supports of the molds (16,18), and of the type in which the molding unit (10) has, between at least one of the mold-halves (12) and the associated support (16), compensating means (30) which push the mold-half (12) transversely toward the other mold-half (14),

characterized in that the mechanism (24) for moving the supports is linked to at least said associated support (16), by means of elastically deformable means (46) that are suitable for compensating for the deformation of the support (16) created by the forces exerted by the compensating means (30).

2. Molding unit according to claim 1, characterized in that the movement mechanism acts on the plate (34), which is transversely slideably mounted on the support (32, 16), and in that the spring forming means (46) are interposed transversally between the plate (34) and the support (32, 16).

3. Molding unit according to either of claims 1 or 2, characterized in that the plate (34) can pivot with respect to the support (16).

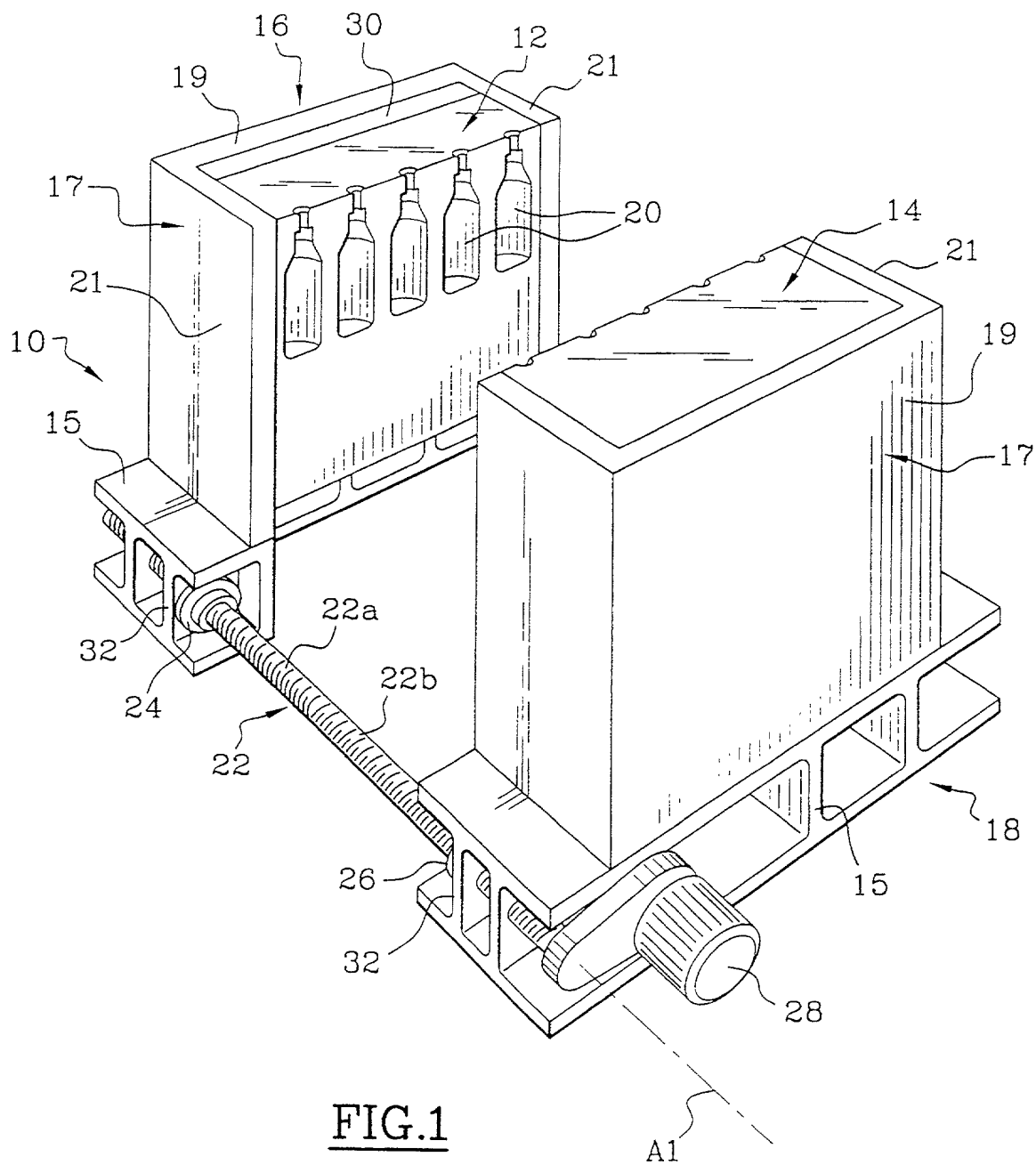
4. Molding unit according to either of claims 2 or 3, characterized in that the spring forming means comprise blocks of elastomer material (46).

5. Molding unit according to any of the preceding claims, characterized in that the mechanism for moving the two supports (16, 18) is comprised of a drive screw (22), which is furnished with two threaded sections (22a, 22b), the direction of turn of the threads of the two sections being opposite, and each threaded section cooperating with a nut (24, 26) linked to one of the supports, and in that the elastically deformable means (46) are interposed between the nut (24) and the support (16) to which it is linked.

6. Molding unit according to claim 5, characterized in that the nuts (24, 26) are ball-race nuts.

7. Molding unit according to any of the preceding claims, characterized in that it comprises compensating means (30) only between one (12) of the mold-halves and the associated support (16), and in that the elastically deformable means (46) are interposed only between said associated support and the mechanism for moving the supports (16, 18).

8. Extrusion-blow molding machine, characterized in that it comprises at least one molding unit according to any of the preceding claims.



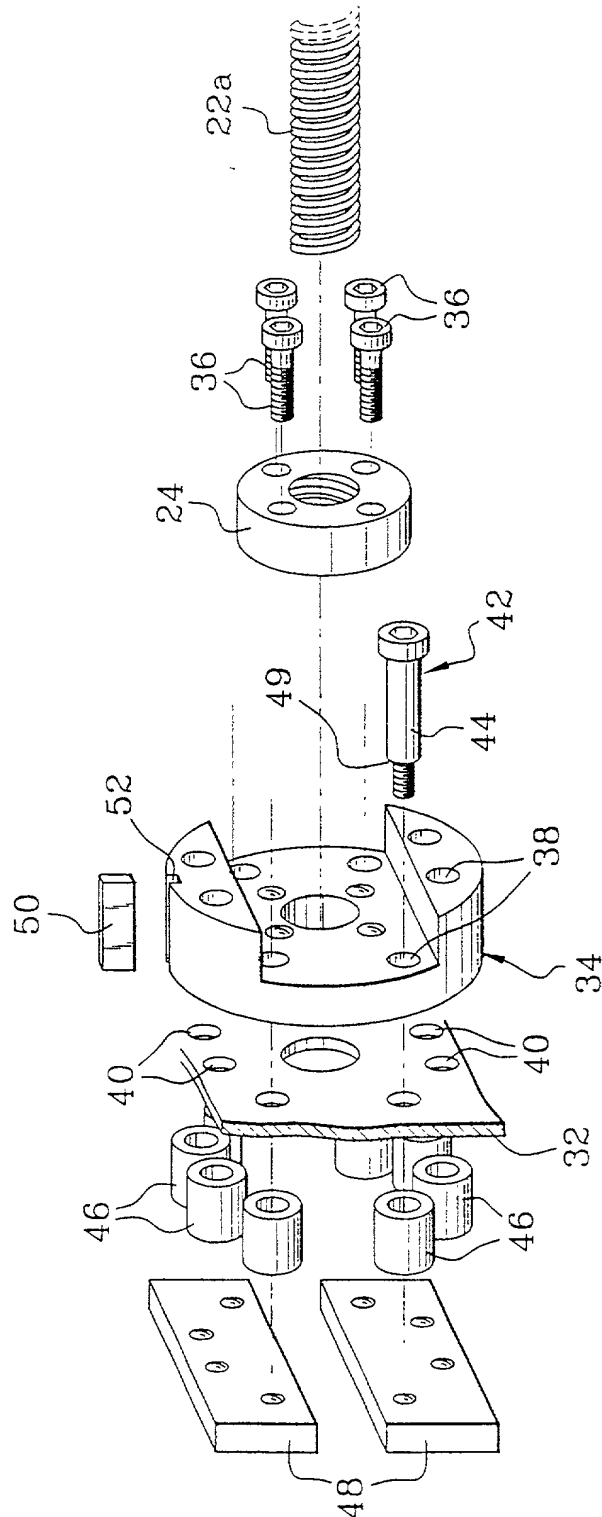
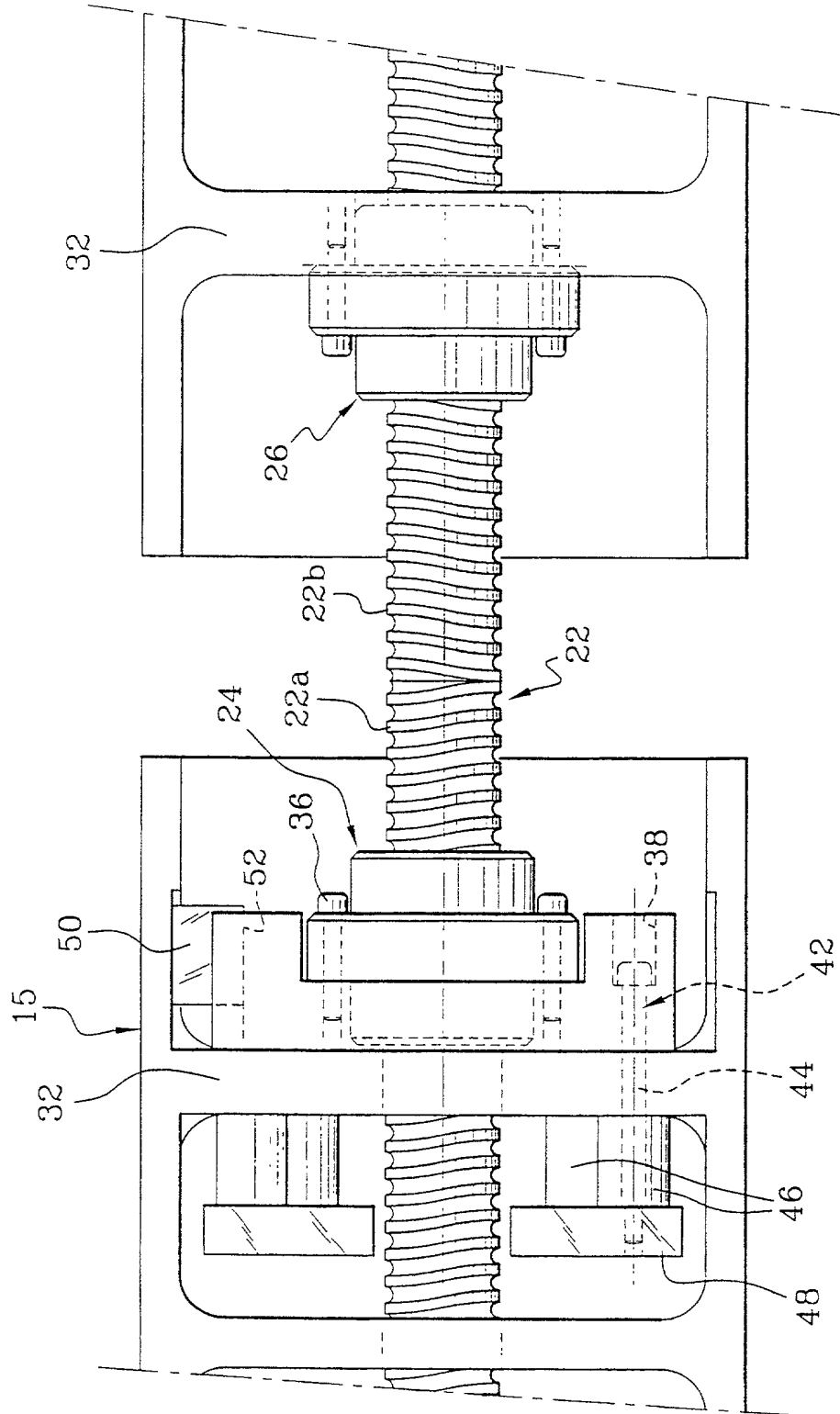
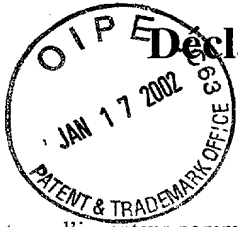


FIG. 2



Declaration and Power of Attorney for Patent Application



Déclaration et Pouvoirs pour Demande de Brevet

French Language Declaration

En tant que l'inventeur nommé ci-après, je déclare par le présent acte que:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention intitulée

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MOLDING UNIT AND EXTRUSION-BLOW MOLDING

MACHINE EQUIPPED THEREWITH

et dont la description est fournie ci-joint à moins que la case suivante n'ait été cochée:

a été déposée le
sous le numéro de demande des Etats-Unis ou le numéro
de demande international PCT
et modifiée le
(le cas échéant).

the specification of which is attached hereto unless the following box is checked:

☒ U.S. Serial No. 09/914/648, filed August 31, 2001,
which is the U.S. National Stage Application of PCT/FR00/00466,
filed February 24, 2000.

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises, telles que modifiées par toute modification dont il aura été fait référence ci-dessus.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

French Language Declaration

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, en cochant la case, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée.

Prior foreign application(s)
Demande(s) de brevet antérieure(s)

99/02928
(Number)
(Numéro)

French
(Country)
(Pays)

(Number)
(Numéro)

(Country)
(Pays)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevet provisoire effectuée aux Etats-Unis et figurant ci-dessous.

(Application No.)
(N° de demande)

(Filing Date)
(Date de dépôt)

(Application No.)
(N° de demande)

(Filing Date)
(Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande:

(Application No.)
(N° de demande)

(Filing Date)
(Date de dépôt)

(Application No.)
(N° de demande)

(Filing Date)
(Date de dépôt)

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique; et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d'une incarcération, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Not Claimed
Droit de priorité non revendiqué

March 8, 1999
(Day/Month/Year Filed)
(Jour/Mois/Année de dépôt)



(Day/Month/Year Filed)
(Jour/Mois/Année de dépôt)



I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Status)(patented, pending, abandoned)
(Statut)(breveté, en cours d'examen, abandonné)

(Status)(patented, pending, abandoned)
(Statut)(breveté, en cours d'examen, abandonné)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

French Language Declaration

POUVOIRS: En tant que l'inventeur cité, je désigne par la présente l'(les) avocat(s) et/ou agent(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marques: (*mentionner le nom et le numéro d'enregistrement*).

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (*list name and registration number*)

John H. Mion, Reg. No. 18,879; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765; Robert M. Masters, Reg. No. 35,603; George F. Lehnigk, Reg. No. 36,359; John T. Callahan, Reg. No. 32,607; Steven M. Gruskin, Reg. No. 36,818; Peter A. McKenna, Reg. No. 38,551 and Edward F. Kenahan, Reg. No. 28,962

Adresser toute correspondance à:

Send Correspondence to:
SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, N.W., Suite 800
Washington, D.C. 20037-3213

Adresser tout appel téléphonique à:
(*nom et numéro de téléphone*)

Direct Telephone Calls to: 202-293-7060
(*name and telephone number*)

Nom complet de l'unique ou premier inventeur	1-00	Full name of sole or first inventor	Philippe DEROUAULT
Signature de l'inventeur	Date	Inventor's signature	13/12/01
Domicile		Residence	c/o Sidel, Avenue de la Patrouille de France, 76930 Octeville-sur-Mer, France
Nationalité		Citizenship	French
Adresse postale		Post Office Address	Same as residence
Nom complet du second co-inventeur, le cas échéant	2-00	Full name of second joint inventor, if any	Eric LEMAISTRE
Signature du second inventeur	Date	Second inventor's signature	10/12/01
Domicile		Residence	c/o Sidel, Avenue de la Patrouille de France, 76930 Octeville-sur-Mer, France
Nationalité		Citizenship	French
Adresse postale		Post Office Address	Same as residence